3D PRINTING HIGH-PERFORMANCE PIEZOELECTRIC MATERIALS WITH EXTREME PROPERTIES

Tech ID: 33490 / UC Case 2024-089-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Advancing the manufacturing of high-performance piezoelectric materials, UC Berkeley researchers have developed a novel 3D printing method for creating textured ceramics with extreme properties. The process utilizes a specialized photosensitive resin composed of a photo monomer, a matrix ceramic, and integrated template seeds. By applying an alternating electric field during the Digital Light Projection (DLP) printing process, the template seeds are precisely aligned within the resin before curing. The resulting structure is then sintered to create a textured ceramic that exhibits superior piezoelectric performance compared to traditionally manufactured materials. This additive manufacturing approach allows for the creation of complex, high-strength geometries essential for advanced acoustic and pressure-sensing applications in extreme environments.

SUGGESTED USES

Complex Geometry Support: Enables the fabrication of intricate piezoelectric shapes, such as curved or hollow structures, impossible to achieve with traditional casting.

Superior Material Texture: The texturing process results in "extreme properties" by ensuring the matrix ceramic and template seeds achieve high-density alignment.

In-Situ Field Alignment: Use of an alternating electric field during the 3D printing process ensures uniform orientation of piezoelectric elements without post-processing.

Scalable Additive Manufacturing: The DLP-based approach offers a faster, more repeatable path for producing high-performance ceramic components for defense and aerospace.

Extreme Environment Stability: Sintered textured ceramics provide the mechanical and thermal stability required for the rigors of hypersonic and maritime deployments.

ADVANTAGES

Complex Geometry Support: Enables the fabrication of intricate piezoelectric shapes that are impossible to achieve with traditional casting or machining.

Superior Material Properties: The texturing process results in "extreme properties" and higher piezoelectric coefficients than non-textured counterparts.

Precision Alignment: Use of an alternating electric field during 3D printing ensures uniform orientation of piezoelectric elements throughout the structure.

Scalable Manufacturing: The DLP-based approach offers a faster, more repeatable path for producing high-performance ceramic components.

Enhanced Durability: Sintered textured ceramics provide the mechanical and thermal stability required for hypersonic and maritime applications.

RELATED MATERIALS

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

» **Engineering**

» Engineering

» **Materials & Chemicals**

» Ceramics

» Other

» **Research Tools**

» Other

» **Sensors & Instrumentation**

» Physical Measurement

RELATED CASES

2024-089-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Inverse Designing Metamaterials With Programmable Nonlinear Functional Responses
- Large Area, High Resolution Projection Lithography System With Moving Optics
- Method To Inverse Design Mechanical Behaviors Using Artificial Intelligence

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